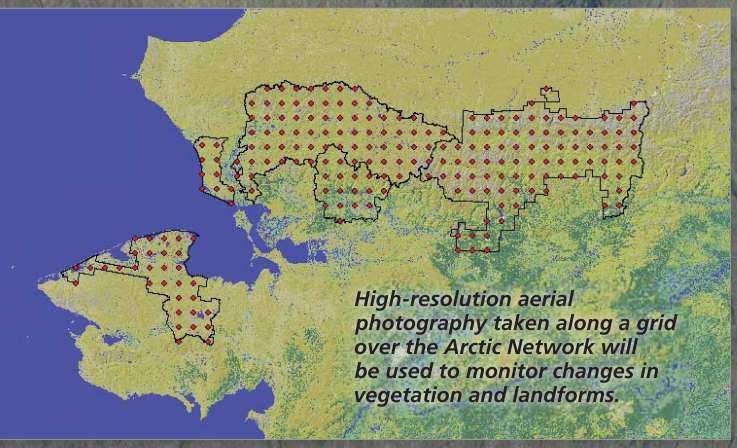
Arctic Network

Bering Land Bridge N Pres. • Cape Krusenstern NM
Gates of the Arctic NP & Pres. • Kobuk Valley NP • Noatak N Pres.

Terrestrial Landscape Dynamics Resource Brief

October 2010, no. 28



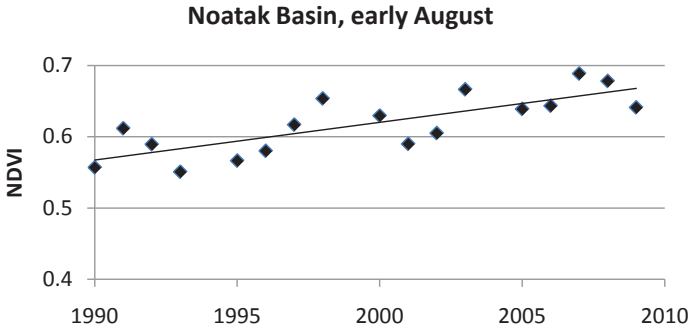
High-resolution aerial photography taken along a grid over the Arctic Network will be used to monitor changes in vegetation and landforms.

Low-altitude aerial photographs portray details in land surface features, such as ice-wedge polygons (the angular lines), small lakes, and shrub patches (the dark green areas) in a section of Bering Land Bridge National Preserve.

Status & Trends

Terrestrial landscape dynamics in the Arctic Network

Satellite greenness measurements over the Arctic Network from 1990 through 2009 vary greatly between years, especially in the spring, due to variations in the weather. But over this variability is a steady increase in greenness across the two decades that suggests a long-term increase in the amount of vegetation.

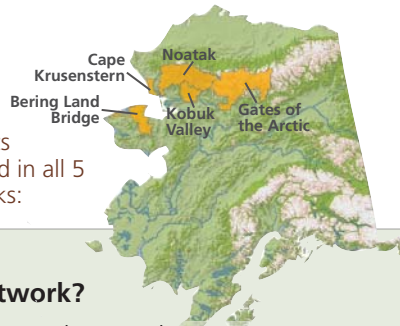


The greenness of vegetation (NDVI) in late summer has increased steadily in the Noatak Basin over the last 20 years, in spite of considerable year-to-year variation.

Objectives

What do we want to know about landscape dynamics in the Arctic Network?

- Long-term trends in the growing season as reflected in greenness of vegetation and the snow-free period.
- Network-wide, long-term trends in land cover types such as shrubs, trees, bare ground, and shallow water, including both the overall cover and spatial patterns such as locations where shrub- or tree-line is advancing.



Landscape dynamics are being monitored in all 5 Arctic Network parks:

Importance

Why are terrestrial landscape dynamics important in the Arctic Network?

Landscape dynamics are the "big picture" of changes in the growing season, vegetation, and surface water. The length and warmth of the growing season control the amount of plant matter, which is the energy supply for all other biological processes and crucial for wildlife. Major changes in vegetation are likely to benefit some species and harm others. A long-term increase in shrubs in the arctic has already been observed. Formation and drainage of ponds and lakes, which are important habitat for many species, are natural processes that may be accelerated by climate change.

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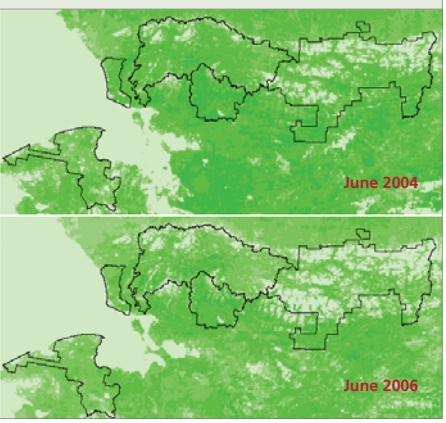
Management Applications

How can monitoring landscape dynamics help protect parks in ARCN?

Landscape changes affect most other natural resources and could influence decisions in wildlife, fire, cultural resource, and visitor management. Our interpretive products will educate visitors and others about the effects of environmental change on arctic ecosystems.



Satellite imagery from June shows that the warm spring of 2004 (upper image) was greener than the cool spring of 2006 (lower image).

Long-term Monitoring:

How will we monitor terrestrial landscape dynamics in the Arctic Network?

- Analyze trends in greenness measured by satellites. Satellites have been measuring the amount of sunlight reflected from the earth in different wavelengths (colors) for over 20 years. We can compute an index of the earth's greenness from these measurements and determine the length of the growing season and its peak greenness.
- Analyze trends in greenness and snow cover measured by remote automated cameras at weather stations. Install cameras at the proposed new NPS climate monitoring stations that will shoot daily photographs of the same scene through the spring, summer, and fall. From these photographs we will track changes in the length of the snow-free season, the growing season, and the peak greenness of the vegetation, and relate these things to weather measurements. They will provide an on-the-ground check of satellite measurements.
- Analyze changes in vegetation and other land surface features visible on high-resolution aerial photographs. We have a set of detailed aerial photographs taken on a 20-km grid across the Arctic Network. On these photographs we can measure things like shrub cover, tree cover, and area of small ponds caused by thawing permafrost. We plan to repeat these photographs every 10 years and compare the dates to get a network-wide view of changes over time.
- Analyze the change in area of lakes and ponds using satellite images.

These lakes in Kobuk Valley National Park drained due to erosion of a new outlet stream channel.

ARCTIC NETWORK

USING SCIENCE TO PROTECT OUR PARKS

THE ARCTIC NETWORK (ARCN) IS A MAJOR COMPONENT OF THE NATIONAL PARK SERVICE'S STRATEGY TO BETTER UNDERSTAND AND MANAGE PARK LANDS USING SCIENTIFIC INFORMATION. IT IS ONE OF FOUR INVENTORY AND MONITORING NETWORKS IN ALASKA AND 32 NATIONWIDE.

The Arctic Network provides scientific support to five parks covering more than 19 million acres. Bering Land Bridge National Preserve and Cape Krusenstern National Monument share similar coastal resources and biogeographic ties to the former land bridge between North America and Asia. Kobuk Valley National Park, Noatak National Preserve and Gates of the Arctic National Park and Preserve span extensive, mountainous terrain at the northern limit of treeline.

The Arctic Network is developing long-term monitoring protocols for 28 'vital signs', or physical, chemical and biological indicators that were selected to represent the overall health of these parklands. Many of these vital signs are expected to show change due to regional and global stressors including climate change and deposition of industrial contaminants. Many vital signs also have important human values including for subsistence.

ARCN VITAL SIGNS:

- Air Contaminants
- Brown Bears
- Caribou
- Climate
- Coastal Erosion
- Dall's Sheep
- Fire Extent & Severity
- Fish Assemblages
- Invasive/Exotic Diseases
- Invasive/Exotic Species
- Lagoon Communities & Ecosystems
- Lake Communities & Ecosystems
- Landbird Monitoring
- Moose
- Muskox
- Permafrost
- Point Source Human Effects
- Sea Ice
- Small Mammal Assemblages
- Snow & Ice
- Stream Communities & Ecosystems
- Subsistence/Harvest
- Surface Water Dynamics & Distribution
- Terrestrial Landscape Patterns & Dynamics
- Terrestrial Vegetation & Soils
- Visitor Use
- Western Yellow-billed Loons
- Wet & Dry Deposition

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